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This study reports an attempt to measure differences in learners caused by audio tape and lecture procedures in a social science course. The sample consisted of only two classes, both taught by the same teacher. Three measures were used in evaluation of the two procedures: (1) scores on the Allport-Vernon-Lindsey Study of Values; (2) scores on the Sequential Test of Educational Progress, and (3) final course grades. The research design followed pretest-posttest control group procedure. Among the conclusions, it was found that there is no significant statistical difference between the treatments as indicated by the three measures employed. There is substantial evidence that the experimental procedure (tape) is associated with lower drop-out rates than the lecture procedures. The instructor reported more active discussion in the experimental group. It is recommended that if costs, in terms of student and teacher time, are not prohibitive, the tape procedure be continued and refined. Replication of this study has produced similar results. (JC)

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DALLAS COUNTY JUNIOR COLLEGE DISTRICT

RESEARCH STUDY 68-1

COMPARISON OF AUDIO TAPE AND LECTURE PROCEDURES IN SOCIAL SCIENCE 131

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PURPOSE: To determine if: (1) changes in scores on the Allport-Vernon-Lindsey (AVL) Study of Values; (2) changes in scores on the Sequential Test of Educational Progress, and (3) differences in final course grades are associated with the two different procedures.

PROCEDURE: The study involved two sections of Social Science 131, the first semester of American Civilization. These sections were taught by the same instructor. One section was designated the experimental section and received the tape procedure (see appendix). The other section was designated the control section and received the usual three lecture hours per week. The initial enrollment in the experimental section was 39 students, and the initial enrollment in the control section was 28 students. No attempt was made to equate these groups. The students selected the experimental sections through the usual course selection procedure with counselors. The control section was composed of policemen enrolled in a program designed for the Dallas Police Department. At the time sections were selected, the students did not know that an experiment was to be undertaken.

Early in the semester, the students were given the AVL and the STEP. These tests were readministered late in the semester, shortly before final examinations. ACT scores were also available on most of the students through the usual admission requirements. Final course grades (A = 4, C = 3, etc.) provided the third criterion variable. Both sections received the same tests.

The following questions were asked of the data. A brief description of the analytical procedures are indicated. Details of the procedure are found in the appendix.

(1) A chi square test was used to determine if there were statistically significant differences between the proportion of students finishing the semester with a grade of D or better in the two sections.

(2) Gain scores were computed on each of the six AVL scales and the STEP by subtracting the pretest from the post-test. Multiple Linear Regression analyses were computed to see if there were statistically significant differences between the groups on these seven Gain scores and on the final

grade. The ACT Social Science and Composite scores were introduced to account for differences in ability. The square of the pretest score was introduced as a control to allow for differences on initial scores on the pretest. Only students completing the course with a grade were used in these analyses.

RESULTS: The contingency table in Figure 1 describes the frequencies with which the course was completed or not completed within the experimental and control group. The results are highly significant, statistically. A greater proportion of students completed the course under the tape procedure, as compared to the lecture procedure. These results must be viewed with the following reservations:

1. The higher failure drop rate in the control group, which was an essentially different group, may be inflated by problems that did not affect the experimental group, such as job requirements, workshift conflicts, etc.

2. Initial differences on the ACT Social Science and ACT Composite tests are not taken into consideration by the chi square analysis. Indications of these differences, presented in Table 1, shows that the control group has much higher mean scores on the ACT tests and that there is little difference between the ACT means for the group totals as opposed to those that complete within each group. The direction of these differences, the control group having the higher mean scores, tends to confirm the differences and completion rates.

Table 2 reports the differences in gain scores on the STEP and AVL scales and the final grade, that might be expected between the experimental and control group. (The numbers reported are actually the partial regression coefficients associated with the $X^{(7)}$ for gain scores and $X^{(5)}$ for final grades vector in the full models. See appendix.)

Although none of these differences have a high degree of statistical significance, the positive differences (indicating that greater gain scores are associated with the experimental group) found for the AVL Economic, Political, and Religious scales are congruent with what one might wish to find for a Social Science course. There would be no apparent reason for desiring greater gain scores for the Theoretical and Aesthetic scales. One might wish to see a greater gain score for the Social scale of the AVL, the STEP, and the final grade.

It must be remembered that the AVL scales measure rather basic interest dimensions and any great amount of change over a short time period would not be generally expected.

REPLICATION: The study was extended into the Spring, 1968, semester using two sections both composed of students representative of the general student enrollment. No identifiable characteristics distinguished the students in the control section from the experimental section.

The same questions were asked and the same procedures were used.

Figure 2 describes the frequencies with which the course was completed or not completed within the control and experimental sections. As before, a greater proportion of the students complete the experimental version of the course than the control section. A greater proportion of students drop, withdraw, etc. in the control (lecture) section. The confidence that can be placed in this difference is somewhat less than that indicated by the Fall semester X^2.

The combined probability of the two separate chi square analyses is less than .02 ($\chi^2 = (-2)\sum \log_e p = 13.0$, with 4 degrees of freedom). Both studies provide substantial evidence that the experimental procedure (tapes) is associated with a greater course completion rate and a smaller drop-out rate.

The results of the Spring semester regression analyses are presented in Table 3. Although some of the total mean gain scores changed (e.g., compare Table 2 and Table 3 for AVL Economic, Aesthetic and Political total mean gains) the pattern of differences between experimental and control group gain scores is almost identical. None of the differences are significant, however, even when taken in combination with the Fall semester results.

Since there was no reason to suspect differences on ACT scores between the Spring groups, and since the ACT Social Science and Composite scores were included statistically in the analyses, data analogous to that in Table 1 were not computed for the Spring semester students.

CONCLUSIONS:

(1) There is no convincing evidence that the tape and lecture procedures are associated with differential achievement (final grades), changes in values (AVL "gain" scores) or changes in STEP scores. If the observed differences were substantiated, they are in what appears to be desirable directions (AVL Economic, Political and Religious) for the tape procedure except possibly for the STEP gain scores.

(2) There is substantial evidence that the tape procedure is associated with lower drop-out and higher course completion rates than the lecture procedure.

(3) The instructor (Mrs. Gladys Leff) made the following observations: more active discussion occurred in the tape group than in the lecture group; the students in the experimental group also exhibit more willingness to engage in dialogue among themselves than do the students in the lecture group.

If the costs (mainly student and teacher time) are not prohibitive as compared to the above indicated results, the tape procedure should be continued and refined to increase its effectiveness.

FIGURE 1

CONTINGENCY TABLE

		Passed Course ? Yes	No
Group	Experimental	a 29	b 7
	Control	c 13	d 15

$X^2 = 6.69$, df = 1, $p < .01$ (corrected for continuity)

FIGURE 2

CONTINGENCY TABLE

	Passed Coourse ? Yes	No
Experimental	36	2
Control	32	7

$X^2 = 1.90$, df = 1, $.10 < p < .20$ (corrected for continuity)

TABLE 1

ACT MEAN SCORES

	ACT--Social Science	ACT--Composite
Experimental - Completers	14.0	13.8
Total	13.8	13.8
Control - Completers	18.8	17.0
Total	18.4	16.8

TABLE 2

EXPECTED DIFFERENCES *
(Experimental Minus Control)
Between Groups Holding Other Variables
Constant and Total Means For Fall Semester Data

Criterion Gain Scores (Post-test minus Pre-Test)	Difference	Total Mean
STEP	-3.35	.25
AVL - Theo	-1.66	.89
AVL - Eco	+1.53	3.21
AVL - Asth	- .56	-3.07
AVL - Soc	- .05	-1.68
AVL - Pol	+2.16	.97
AVL - Rel	+4.63	.84
Final Grade	- .06	2.90

*None of these are statistically significant. A probability of .11 was the smallest obtained.

TABLE 3

EXPECTED DIFFERENCES *
(Experimental Minus Control)
Between Groups Holding Other Variables
Constant and Total Means for Spring Semester Data

Criterion Gain Scores (Post-Test minus Pre-Test)	Difference	Total Mean
STEP	-1.24	1.11
AVL - Theo	-1.98	.09
AVL - Eco	2.73	.89
AVL - Asth	-1.71	.06
AVL - Soc	-0.91	1.55
AVL - Pol	1.11	-2.05
AVL - Rel	1.86	-1.41
Final Grade	- .0279	2.44

* None of these are statistically significant. A probability of .09 was the smallest obtained.

APPENDIX A:

The following multiple linear regression models were generated to test the indicated hypotheses.

1. Are there differences between the AVL "gain" scores (post-pre) for tape and lecture students with the same pre-AVL score and the same ACT Social Science and Composite scores ?

2. Are there differences between the STEP "gain" scores (post-pre) for tape and lecture students with the same pre-STEP score and the same ACT Social Science and Composite scores?

3. Are there differences between the final grades of tape and lecture students with the same ACT Social Science and Composite scores?

For questions 1 (separately for each of the six AVL scores) and 2, the following type of full model was constructed:

Y = gain score (post-pre)
$X^{(1)}$ = pre-test score
$X^{(2)}$ = ACT Social Science score
$X^{(3)}$ = 1 if ACT Social Science score missing, otherwise O
$X^{(4)}$ = ACT Composite score
$X^{(5)}$ = 1 if ACT Composite score missing, otherwise O
$X^{(6)}$ = pre-test score squared = $X^{(1)} \cdot X^{(1)}$ to allow for possible curvilinear relationship (high pre-test scores allow less gain)
$X^{(7)}$ = 1 if tape, O if lecture
$X^{(8)}$ = 1 if lecture, O if tape
$Y = a_1X^{(1)} + a_2X^{(2)} + - - - a_7X^{(7)} + a_8X^{(8)} + e$, with 8 independent predictors

The hypothesis states that a7 = a8 = b, which yields the restricted model

$Y = A_1X^{(1)} + a_2X^{(2)} + --- a_6X^{(6)} + bU + e$, where U is the unit vector. There are 7 independent predictors.

For question 3 the following full model was constructed:

Y = final grade (A = 4, B = 3, etc.)
$X^{(1)}$ = ACT Social Science score

$X^{(2)}$ = ACT Composite score
$X^{(3)}$ = 1 if ACT Social Science score is missing, 0 otherwise
$X^{(4)}$ = 1 if ACT Composite score is missing, 0 otherwise
$X^{(5)}$ = 1 if tape, 0 if lecture
$X^{(6)}$ = 1 if lecture, 0 if tape
$Y = a_1X^{(1)} + a_2X^{(2)} + \cdots + a_6X^{(6)} + e$, with six independent predictors

The hypothesis states that $a_5 = a_6 = b$, which yields the restricted model

$Y = a_1X^{(1)} + a_2X^{(2)} + \cdots + a_4X^{(4)} + bU + e$, where U is the unit vector, with five independent predictors

APPENDIX B:

The purpose of this project with American Civilization (SS 131) was to determine if the use of the taped lecture, followed by a class discussion of that material might be a more effective learning device for the students than the traditional classroom lecture which makes a limited provision for discussion. The students in the American Civilization class are mainly occupational students who, as a rule, do not have exceptionally high verbal abilities. Since many of them do not like to read and find that textual material is difficult to comprehend, this combination of text taped lecture and discussion may prove to be an easier way for students to handle new and somewhat complex material. The students are expected to read the text first, listen to the tape lecture (as often as they wish at their own time) and come to class and discuss the material as a group or react to the material in another manner. Sometimes a film is shown which serves to illustrate the material covered by the text and the lecture.

The control section of the American Civilization class was taught by a traditional combination of lecture and class discussion. Students did not listen to the tapes as part of their required course work.